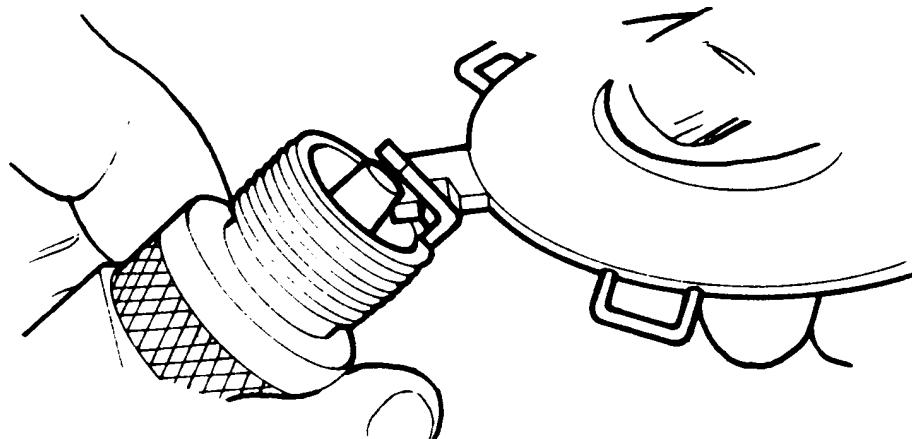


# *HOW - TO* **ENGINE TUNE-UP BASICS**



## *Tool And Material Checklist*

- |   |  |
|---|--|
| <input type="checkbox"/> Service Manual         | <input type="checkbox"/> Oil and Oil Filter        |
| <input type="checkbox"/> Battery Clamp Cleaning | <input type="checkbox"/> Power Timing Light        |
| Tool  | <input type="checkbox"/> Rags                      |
| <input type="checkbox"/> Masking Tape           | <input type="checkbox"/> Knife                     |
| <input type="checkbox"/> Spark Plug Socket and  | <input type="checkbox"/> Screwdrivers              |
| Ratchet   | <input type="checkbox"/> Allen Wrench              |
| <input type="checkbox"/> Wire Spark Plug Gauge  | <input type="checkbox"/> Feeler Gauge              |
| <input type="checkbox"/> Dwell Meter            | <input type="checkbox"/> Safety Glasses or Goggles |

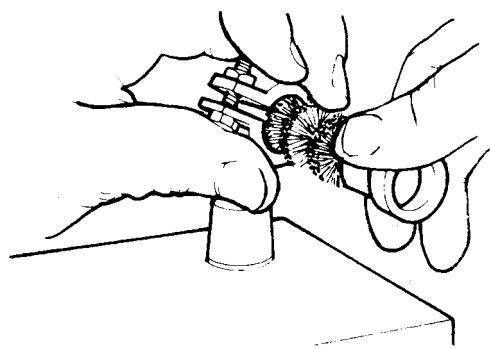
\* This How-To Guide is designed as a general overview of a vehicle repair procedure. You should always refer to a service manual designed for your vehicle for detailed instructions. Parts Plus assumes no liability for an incorrect procedure.

The object of a tune-up is to restore the engine to the performance levels intended by the manufacturer. It calls for the replacement of parts that are approaching or have reached the end of their useful life, and for servicing those that can be restored to "new part" reliability. Adjustments must also be made to the various engine systems so that they meet the manufacturer's specifications and thus can contribute effectively to the car's performance.

A complete tune-up should be performed at least every 10,000 to 12,000 miles on cars with contact ignition systems. On vehicles with electronic ignition systems, tune the engine ever 15,000 to 20,000 miles. Refer to a service manual, a tune-up specification book, or the Vehicle Emissions Control Information (VECI) decal located under the hood for specifications pertaining to your vehicle.

## GENERAL INSPECTIONS

A tune-up should be as complete as possible. Change the oil and oil filter, the air filter, and the fuel filter. Check the battery fluid level and specific gravity. Clean the battery posts and clamps. Check the PCV valve, vacuum hoses, and electrical connections. The latter is especially important in today's electronically controlled cars. Diagrams in your service manual will help you locate the components and their connectors and fuses. Also check for loose, cracked, or hardened spark plug wires. Every three years the spark plug wires should be replaced as a set.



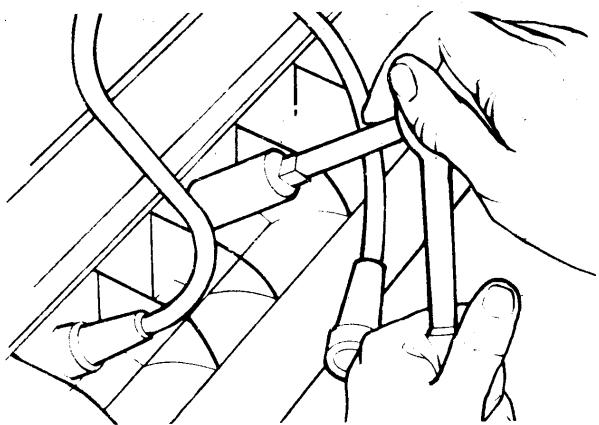
Using a battery clamp cleaning tool

## REPLACING THE SPARK PLUG

Spark plugs are the most critical replacement of the tune-up procedure. To remove them, proceed as follows:

1. Pull off the spark plug wires by carefully grasping the boot and twisting it back and forth. Work one plug at a time to avoid mixing up the wires

**NOTE:** Protect your eyes by wearing safety glasses or goggles when doing this procedure.



Removing spark plugs

2. Label each plug with masking tape so that it is reinstalled on the correct cylinder.

3. Use a spark plug socket and ratchet to remove the plugs. If they are difficult to reach, you might also need extensions and universals.

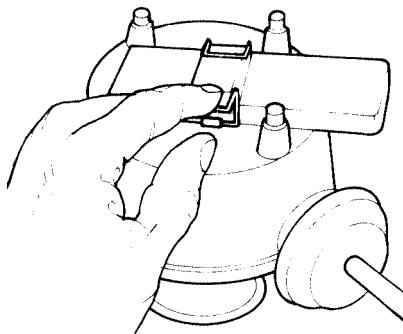
**CAUTION: Be sure to center the plug in the socket. If held at an angle, the socket could break the plug insulator.**

4. Set the gap on the new plugs using a wire spark plug gauge. Consult the tune-up specifications for your car to determine the correct gap.

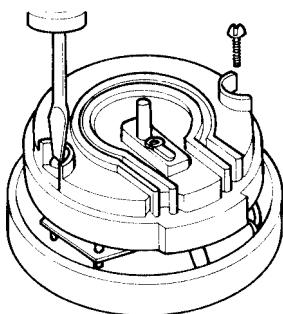
5. Thread the plugs into the holes by hand. Finger tighten them another 1/8 of a turn, using the socket wrench. Do not over tighten.

## **REPLACING THE DISTRIBUTOR CAP AND ROTOR**

Next, remove the distributor cap and clean the inside with a dry rag. If the terminals are corroded or if the cap is cracked or shows signs of carbon tracking (lines running from one terminal to another), replace the cap. Remove the rotor. Examine it for cracks, chips, and carbon tracking. If the rotor is cracked or if the tip is burned or corroded, replace it.



Removing the distributor cap



Removing the rotor

**NOTE:** Some newer electronic ignitions have a special silicone grease covering the distributor cap terminals and rotor tip. If this grease is removed, replace it with fresh grease.

## **REPLACING THE POINTS**

If your car has the older contact ignition system, the points and condenser must be replaced:

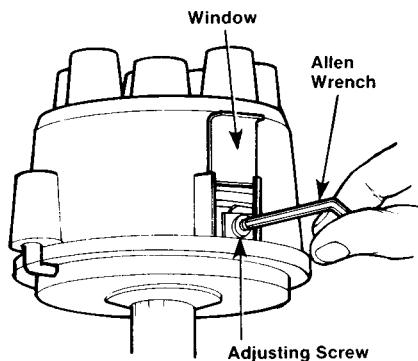
1. If your car has a window radio antenna, there will be a shield over the points; pull it off.
2. The points and condenser are held in place by set screws; two wires fit in a clip and can be simply pulled loose. However, on some cars the wires are held in place by a nut.
3. After removing the wires from the points, very carefully loosen and remove the condenser and point's hold-down screws.
4. Lift the parts off the distributor plate and clean the plate and cam with solvent. If lubricant is supplied with the tune-up kit, coat the cam.
5. Place the new condenser on the plate exactly as the old one came off. Secure it with the screws.
6. Place the points on the plate, with the guide hole on the points positioned over the guidepost. Replace and tighten the screws and connect the wires to the points.

**NOTE: If possible, install "uni-points" or their equivalent. Uni-points house the points and condenser in one unit. This avoids the difficult job of installing the condenser separately.**

## **ADJUSTING THE POINTS**

To adjust the points on a GM vehicle:

1. Replace the rotor and distributor cap.
2. Locate the access window and insert an Allen wrench into the set screw adjusting nut.
3. Start the engine. If it fails to start, turn the wrench one way, then the other until it fires.



Using an allen wrench to adjust the points

4. With the engine running, turn the wrench to the right until the engine starts to miss or dies. Then turn the wrench a half turn back to the left. This should be the correct point gap setting.

#### To adjust the points on a non-GM vehicle:

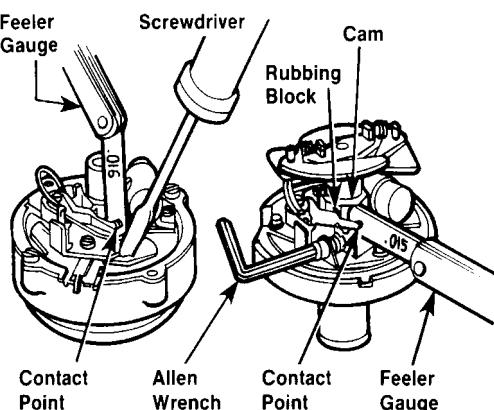
1. Rotate the engine by turning the fan or bumping the starter switch. Stop when the rubbing block is on the peak of the cam lobe and the points are fully open.

2. Insert a feeler gauge of the correct thickness between the points.

3. Insert a screw driver into the special adjusting slots on the points plate and adjust the gap until the gauge drags lightly when inserted in the gap.

4. Carefully tighten the set screw and double-check the gap.

5. Replace the rotor and distributor cap.



Adjusting the points on a non-GM vehicle

## SETTING THE DWELL

#### To check the dwell, proceed as follows:

1. Install a dwell meter according to the manufacturer's instruction.

2. Set the meter to "dwell" if it is a combination tach/dwell. Flip the switch to either 6- or 8-cylinder – whichever is appropriate. If testing a 4-cylinder engine, set the selector on 8-cylinder and mentally double the reading.

3. Start the engine and allow it to warm up. Make sure the idle is reasonably close to the proper speed to ensure a correct dwell reading.

4. If the dwell angle is not to specifications, the points must be readjusted.

5. Dwell that is too high means the points are staying closed too long – widen the gap.

**NOTE:** The easiest way to remember this is that if the dwell is too small, the point gaps should be made smaller.

To set the dwell on a GM car, simply insert an Allen wrench into the adjusting nut and turn it until the dwell is correct. If the dwell is high, turn the nut clockwise to open the points. If the dwell is low, go counterclockwise to close the points.

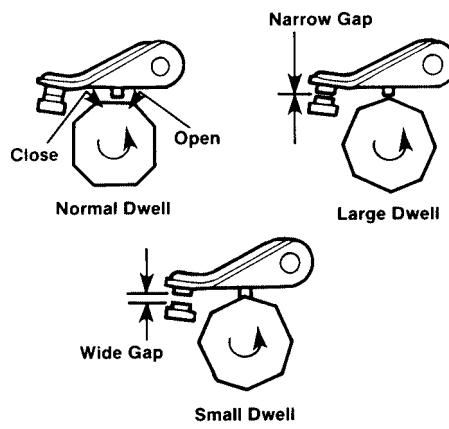
#### To adjust the dwell on a non-GM car, proceed as follows:

1. Remove the distributor cap and rotor.

2. Have a helper crank the engine just long enough to get a reading on the meter.

3. Make the point gap adjustment – high reading a wider gap; low reading, a narrower gap.

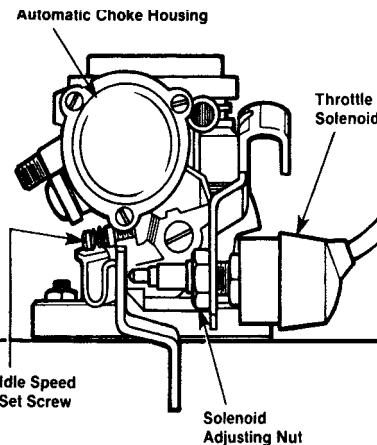
4. Crank the engine again to check the new setting. Continue this procedure until you get an accurate reading.



Dwell comparison

## ADJUSTING THE IDLE SPEED

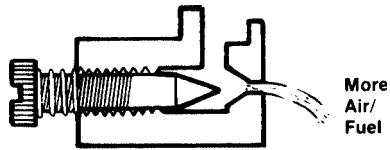
If your car has a computer-controlled ignition system, refer to a service manual or the VECI decal for instructions on setting the idle speed. On vehicles with conventional systems, locate the idle set screw at the throttle linkage or anti-dieseling solenoid. Turned clockwise, it increases idle speed; turned counterclockwise, it decreases idle speed.



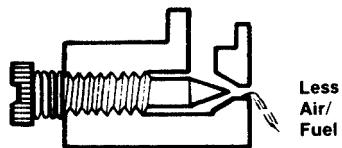
**Location of the idle set screw**

### Here are some points to remember when adjusting idle speed:

1. Be sure the engine is fully warm and off the fast idle cam when adjusting the curb idle.
2. If the idle is set with the air cleaner off, double-check it with the cleaner unit in place.
3. Never try to smooth out the idle by turning up the speed; a higher idle just wastes gas and contributes to dieseling.



**Needle Out Two Turns**



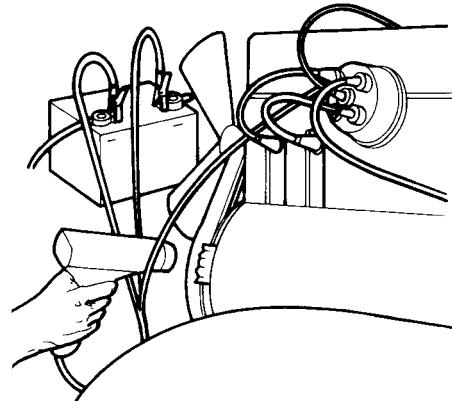
**Needle Out One Turn**

**Controlling the air/fuel mixture**

## ADJUSTING THE IGNITION TIMING

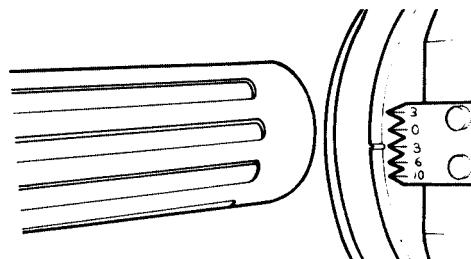
You're now ready to make the final and most important adjustment: the ignition timing.

1. Hook up a power timing light. Attach the red lead to the positive battery terminal and the black lead to the negative terminal.



**Hooking up the power timing light**

2. A third lead has a special connector that attaches to the number one cylinder plug wire. (The service manual will show the location of the number one cylinder pickup at the distributor cap.)
3. Consult the service manual for the location of the timing marks. Rotate the engine by hand or tap the ignition switch until the marks are visible.
4. Clean the dirt off the timing marks with solvent to see them better.
5. Very carefully make a neat line with white chalk or white enamel paint over the correct timing mark. This will help you see the mark when the engine is running.
6. Start the engine and let it warm. The engine



**Checking the timing marks**

must be fully warmed and idling at the proper speed to set the timing.

7. While the engine warms, check the service manual or the VECI decal to see if there are any special timing procedures. Most engines with contact ignition systems must be timed with the vacuum advance line removed at the distributor and plugged. The best way to do this is by attaching a vacuum gauge in the end of the line.

8. Aim the light carefully at the timing marks; not aiming the light properly is one of the primary causes of timing error. Keep the light at about a 45° angle and sight directly down the light.

**CAUTION: Stay away from the cooling fan blades at all times.**

9. The light flashes when the number one cylinder fires and makes the timing marks appear to stand still. The specified mark and timing pointer will align on each flash if the engine is in time.

10. If they don't line up, you will have to adjust the timing by rotating the distributor. To do this, first loosen the clamp bolt that holds the distributor in place. On most older engines that bolt is easy to get to; however, on many newer engines the bolt is located behind the distributor. You might need a special distributor wrench or swivel attachment on a ratchet extension to get to the bolt.

11. To adjust the timing, rotate the distributor slowly until the timing mark and pointer align. Then carefully lock down the clamp bolt and double-check to be sure the setting did not change when the distributor was tightened.